544

# PHYSICS ABSTRACTS

BEING

## SCIENCE ABSTRACTS—SECTION A

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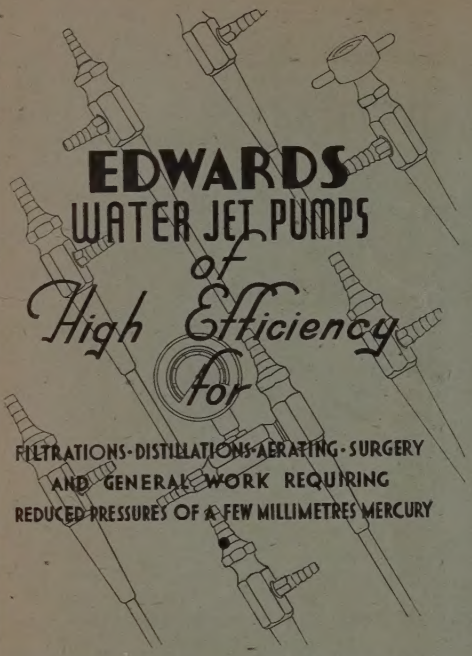


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## MATHEMATICS

781 512.12

**On some infinite sets of numbers.** SILBERSTEIN, L. *Phil. Mag.*, 34, *pp.* 32–34, *Jan.*, 1943.—Considers sets n which each number is the a.m. of the preceding 2, 3, 4 . . . etc.

*See Abstr.* 833 512.37 : 518.5 : 621.317.35 : 534.522.5

782 512.89

**On the product of three homogeneous linear forms. IV.** DAVENPORT, H. *Proc. Camb. Phil. Soc.*, 39, *pp.* 1–21, *Jan.*, 1943.

*See Abstr.* 786 512.896 : 513.723.6

783 512.897 : 517.32 = 4

**On the proper values of Hermittian operators.** WAVRE, R. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 61–63), 1942.

784 513.612.6 = 4

**On the parabolic points on an algebraic curve.** ROSSIER, P. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 40–41), 1942.

785 513.628

**The fixed part of the canonical system.** BRONOWSKI, J. *Proc. Camb. Phil. Soc.*, 39, *pp.* 31–34, *Jan.*, 1943.

*See Abstr.* 793 513.66 : 519.48

786 513.723.6 : 512.896

**Some enumerative results in the theory of forms.** HODGE, W. V. D. *Proc. Camb. Phil. Soc.*, 39, *pp.* 22–30, *Jan.*, 1943.—The paper results from an attempt to re-write Littlewood's proof [Abstr. 3 (1943)] in a less specialized form based on $k$-connexes.

*See Abstr.* 783 517.32 : 512.897 = 4

787 517.433 : 621.3.018.7

**Steady-state currents of electrical networks.** WAIDELICH, D. L. *J. Appl. Phys.*, 13, *pp.* 706–712, *Nov.*, 1942.—[Abstr. 683 B (1943)].

788 517.544 = 4

**Invariant solutions $D_{\kappa^2}(x, y)$ of the equation $(\Box - \kappa^2)\, D = 0$ in pseudo-Euclidean space.** STUECKELBERG, E. C. G. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat. Genève*, 59, *pp.* 49–52), 1942.

789 517.544 : 530.145.61 = 4

**Invariant solutions $D_{\kappa^2}(x, y)$ of Schrödinger's relativistic equation.** STUECKELBERG, E. C. G. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 53–58), 1942.

790 517.564.3

**Notes on the reversion of a series.** BICKLEY, W. G., AND MILLER, J. C. *Phil. Mag.*, 34, *pp.* 35–36, *Jan.*, 1943.—In obtaining the McMahon expansions for the zeros of Bessel functions, series must be reversed of a type which is not covered by the general formulae. The principle of one of the methods given is, however, applicable to these series.

791 517.564.3

**Formulae relating to Bessel functions of moderate or large argument and order.** BICKLEY, W. G. *Phil. Mag.*, 34, *pp.* 37–49, *Jan.*, 1943.—Formulae for the computation of the zeros of the derivatives of Bessel functions, particularly those corresponding to the various asymptotic expansions for the functions themselves, are given. Interconnections betw. formulae for the derivatives and those for the functions, and some new results for the functions, have been found.

792 517.63 : 534.131

**The application of the Laplace transformation to a problem on elastic vibrations.** TRANTER, C. J. *Phil. Mag.*, 33, *pp.* 614–622, *Aug.*, 1942.—The vibrations in a thick elastic cylindrical tube of inf. length under an internal pressure which varies with the time are investigated by a method which gives the amplitudes of the vibrations. The solution to the similar problem for the sphere is also given. G. E. A.

*See Abstr.* 864 517.942.82 : 536.212

*See Abstr.* 833 518.5 : 512.37 : 621.317.35 : 534.522.5

793 519.48 : 513.66

**Bases for the prime ideals associated with certain classes of algebraic varieties.** GODDARD, L. S. *Proc. Camb. Phil. Soc.*, 39, *pp.* 35–48, *Jan.*, 1943.—A theorem of wide generality is proved and examples are given of some classes of varieties satisfying the conditions of the theorem. The base for the prime ideals associated with Veronesean varieties and varieties of Segre are found.

794 519.5

**The measure of plane sets.** MORAN, P. A. P. *Proc. Camb. Phil. Soc.*, 39, *pp.* 51–53, *Jan.*, 1943.

## ASTRONOMY. GEODESY

795 523.165 : 523.746 : 525.24

**Relation of the cosmic radiation to geomagnetic and heliophysical activities.** BROXON, J. W. *Phys. Rev.*, 62, *pp.* 508–522, *Dec.* 1 *and* 15, 1942.—Definite pulses, both in the magnetic character and in sunspot areas, are associated with the primary pulses in the cosmic radiation at Boulder. They are in general phase opposition to the cosmic-ray pulses, but the tip of the magnetic-character pulse precedes the tip of the opposite cosmic-ray pulse by 1 day; the lead was 3 or 4 days in the opposed sunspot pulses. Direct application of Chree's method to the magnetic character and sunspot areas, individually, indicated a 27-day periodicity in the former and a 34-day periodicity in the latter. A second method of investigation yielded contradictory results: it indicated 27-day fluctuations in sunspot areas in phase with the cosmic-ray fluctuations and out of phase with changes in magnetic character.

*See Abstr.* 795 523.746 : 525.24 : 523.165

*See Abstr.* 795 525.24 : 523.746 : 523.165

*See Abstr.* 975 525.3 : 551.583.3 = 3

## PHYSICS: GENERAL

796 53 : 628.8

**Applications of physics to the heating and ventilation of buildings.** DUFTON, A. F. *Nature, Lond.*, 150, *pp.* 678–680, *Dec.* 12, 1942.

797 53(045) = 3 = 4

**Report of the meeting of the Swiss Physical Society, Sion, August 30, 1942.** *Helv. Phys. Acta*, 15, 6, *pp.* 509–526, 1942.—Note on the dynamics of viscous fluids, Mercier, A. [Abstr. 809 (1943)]; Theory of the effect of temperature on the diffraction of X-rays, Bleuler, K., and Weigle, J.; Method of determination of rapidly changing spectra, Maeder, D., and Miescher, E. [Abstr. 842 (1943)]; Spinor invariance and measure invariance in a new fundamental principle, Stueckelberg, E. C. G. [Abstr. 799 (1943)]; Extension of Fresnel's formulae, Mercier, R. [Abstr. 836 (1943)]; Building-up of voltage in the cascade generator, Greinacher, H. [Abstr. 785 B (1943)]; Solution of the space problem, Schames, L. [Abstr. 801 (1943)]; Standard substance for determination of optical absorption, Halban, H. von, and Wieland, K. [Abstr. 849 (1943)]. A. J. M.

798 53.084

**Rigid stands for laboratory apparatus.** Wheeler, L. J. *J. Sci. Instrum.*, 20, *pp.* 15–16, *Jan.*, 1943.

799 530.12 : 530.145 = 4

**Spinor invariance and measure invariance in a new fundamental principle.** Stueckelberg, E. C. G. *Helv. Phys. Acta*, 15, 6, *pp.* 513–515, 1942.—If invariance of spinor quantities and of measure is introduced, a new law for the quantization of a tensor field and a spinor field is obtained, which, in turn, necessitates new laws for the interaction between the electron and photon. A. J. M.

800 530.12 : 531.51

**Note on Einstein's theory of gravitation.** Houstoun, R. A. *Phil. Mag.*, 33, *pp.* 899–903, *Dec.*, 1942.—The deflection of light rays passing near the sun, and the advance of the perihelion of Mercury, both of which are predicted by Einstein's theory of gravitation, can be obtained by Fermat's principle and the principle of least action, respectively. The displacement towards the red of a spectral line emitted by an atom vibrating in a gravitational field is also discussed. Einstein's principle of equivalence is assumed, and it is also agreed that space and time are distorted in a gravitational field. Einstein's stationary principles are not necessary. Relativistic mass is also discussed. It is simpler to base the explanation of relativistic change of mass on the FL contraction and time dilatation than to use the Lorentz transformation. A. J. M.

801 530.12 = 3

**Solution of the space problem.** Schames, L. *Helv. Phys. Acta*, 15, 6, *pp.* 523–524, 1942.—A review of views held concerning the nature of space is given, and the use of the term "curved" space is criticized. A. J. M.

*See Abstr.* 799 530.145 : 530.12 = 4

*See Abstr.* 789 530.145.61 : 517.544 = 4

802 530.145.63

**On the configurations *ll's*.** Racah, G. *Phys. Rev.*, 62, *pp.* 523–525, *Dec.* 1 *and* 15, 1942.—The spectra of the configurations *ll's* are calculated by using Dirac's vector model. A comparison is made with the experimental data of Sc I, Y I and Cu I.

803 531.221.8

**The stresses in an extensible suspension cable.** Pippard, A. J. S., and Chitty, L. *J. Instn Civ. Engrs*, 18, *pp.* 322–333, *June*, 1942.—The cable, whose weight is at first supposed negligible comp. with the loads carried, is supported at 2 points separated by given horizontal and vertical distances. The value of the horiz. component of tension in the cable is found and modified to apply to several particular cases; the shape of the loaded cable can then be determined. A numerical case is stated and solved. The results obtained, with the added factor of the weight of the cable, are applied to determine the size of cable required to carry a given load system with a specified sag and with a given factor of safety. G. E. A.

804 531.225(091)

**A comprehensive review of Saint-Venant's torsion problem.** Higgins, T. J. *Amer. J. Phys.*, 10, *pp.* 248–259, *Oct.*, 1942.—A history of the work of mathematical physicists in solving the problem of the torsion of an isotropic homogeneous right prism of arbitrary length. The case was first considered analytically by Coulomb (1784), then by Cauchy (1829). St. Venant corrected Cauchy's analysis (1839), elaborated his version (1843), and correctly formulated the general problem, solving for the rectangle and ellipse (1847). Boussinesq's memoir (1871) marks the end of the period of formulation, and succeeding effort has been devoted to obtaining exact solutions for sp. cross-sections and to the study of cross-sections not amenable to exact mathematical solution. The bibliography contains 89 entries. G. E. A.

805 531.383

**The gyroscope in the service of mining. II.** Haddock, M. H. *Colliery Engng*, *pp.* 286–287, *Dec.*, 1942.—The Kiel Nautical Instrument Company's gyroscope for bore-hole surveys as used for submarines and warships is described. The instrument has 2 pendulums which swing in 2 planes at rt. angles to one another and the gyroscopic control adjusts them so that one always swings in the meridian. The gyroscopic compass equipment is indicated, the wheel making 25 000 r.p.m. when supplied with current at 400 c./s. An accuracy of 1 in 2 000 is claimed. M.-V.

806 531.391 : 621.392.52

**Analysis of longitudinal motions of trains by the electrical analogue.** Pipes, L. A. *J. Appl. Phys.*, 13, *pp.* 780–786, *Dec.*, 1942.—The rel. motion of a train of $n$ uniform cars and a locomotive is considered. If slack and rolling resistance are neglected, the system may be idealized to that of $(n + 1)$ masses connected by springs. It is assumed that identical shock absorbers are placed betw. the units. By considering the electrical analogue of this dynamical system, its natural frequencies are determined. If the shock absorbers have a certain critical strength, no free oscillatory motion betw. the cars is possible. Expressions are obtained for the velocities of the cars when the locomotive exerts an oscillatory tractive effort. By the use of the operational calculus, the response of the system when the tractive effort is impulsive is determined.

*See Abstr.* 800 531.51 : 530.12

807 531.714

**Two simple precision tools.** Drinkwater, T. W. *J. Sci. Instrum.*, 20, *p.* 16, *Jan.*, 1943.—Describes

(1) a fixture to locate measuring-machine anvils square to their axes when relapping them. It is used for lapping micrometer spindle measuring faces, screw pitch dia. machine indicator anvils, etc.; (2) a sine table of triangular shape. Its accuracy depends entirely on the precise location of the three 1 in. dia. ball bearings.

808 531.732

**Hydrostatic liquid contents gauges.** *J. Sci. Instrum.*, 20, *pp.* 17–18, *Jan.*, 1943.

*See Abstr.* 814 532.14 : 535.324 : 532.612

809 532.517 = 4

**Note on the dynamics of viscous fluids.** MERCIER, A. *Helv. Phys. Acta*, 15, 6, *pp.* 509–511, 1942.—The general equation for the production of eddies without the presence of a solid obstacle, in viscous fluids, is discussed. A. J. M.

810 532.542.1 : 621.186

**The flow of a flashing mixture of water and steam through pipes.** BENJAMIN, M. W., AND MILLER, J. G. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 657–669, *Oct.*, 1942.—[See Abstr. 676 B (1943)].

811 532.582

**An investigation of the stability of bed materials in a stream of water.** ALLEN, J. *J. Instn Civ. Engrs*, 18, *pp.* 1–34, *March*, 1942.—The current velocities necessary to move regular-shaped blocks, flexible bolsters containing stone chippings, or flat beds and mounds composed of chippings, are studied theoretically and practically. At the instant of overturning, the greatest velocity, in ft./sec., between the top of a cubical block and the water surface is $[2g(\rho' - \rho)/\rho]^{\frac{1}{2}}$ where $\rho'$ and $\rho$ denote the density of the block and the water resp. Whilst an isolated bolster is less stable than an isolated cubical block of the same weight, the difference in the case of a random mound is far less marked. The significance of the flexibility of bolsters and their property of interlocking is emphasized. Higher velocities are resisted by embankments of irregularly shaped stones than by cubical pieces of the same weight. J. S. G. T.

812 532.583.4

**Calculated and measured wave resistance of a series of forms defined algebraically, the prismatic coefficient and angle of entrance being varied independently.** WIGLEY, W. C. S. *Trans. Instn Nav. Archit., Lond.*, 84, *pp.* 52–71; *Disc.*, 72–74, 1942.—Calculated and measured wave resistances of 14 ship models of symmetrical form fore and aft, with geometrically similar waterplanes and similar vertical sections, with mid-ship sections defined by parabolic arcs, are compared, the prismatic coeff. and the angle-of-entrance coeff. being varied independently. Tables are given by which the wave resistance of any form of the series can be plotted. Differences of wave resistance calculated for diff. forms agree with measured differences, provided the changes of form are not very large. At very low speeds the wave resistance varies as the $(\tan)^2$ of the angle of entrance, and is not affected by the rest of the form. At such speeds the added skin friction, over and above that calculated from results with planks, may change more than the wave resistance as the form is changed. There is evidence that this component of resistance increases with convexity from a very hollow form up to a slightly convex line and then decreases as the angle of entrance and the convexity are increased. J. S. G. T.

813 532.595 ; 627.844 = 4

**Pulsations in [water] power conduits.** JÖHR, A. *Bull. Ass. Suisse Élect.*, 33, *pp.* 493–496, *Sept.* 9, 1942.—The phenomenon of water hammer in a water conduit supplying water to a Pelton or Francis turbine is interpreted in terms of pulsations set up in the water and conduit by variations in the supply of fluid, and results derived from the theory are compared with results obtained in actual conduits. Apparatus for recording pulsations in conduits is briefly ref. to. J. S. G. T.

814 532.612 : 535.324 : 532.14

**Physical properties and chemical constitution. VII. Alkyl sulphides, disulphides, sulphites, sulphates and orthophosphates.** VOGEL, A. I., AND COWAN, D. M. *J. Chem. Soc.*, *pp.* 16–24, *Jan.*, 1943.—The refr. ind. for the C, D, F and G′ lines at 20·0°, and the surface tensions and densities over a range of temperatures, were determined for alkyl compounds, particularly sulphides and disulphides. The mol. refractivities and parachors are evaluated. The data are employed in the calculation of preliminary values for the const. of S and for the contribution of the O atom in alkyl sulphites and sulphates.

815 532.612 : 576.3

**Cellular forms: the tri-axial cell. I.** HOUSEHOLDER, A. S. *Bull. Math. Biophys.*, 4, *pp.* 159–168, *Dec.*, 1942.—Without assuming a spheroidal shape for the cell, more general approx. deformation equations are derived which allow for non-uniformities in the external diffusion field and within the cell itself. In the absence of such non-uniformities the only stable shapes are those in which the cell is spheroidal. The spherical equilibrium is always stable and the approach monotonic unless there exist 2 non-spherical equilibria, one of prolate type and one of oblate type.

816 532.612 : 576.34

**Equilibrium shapes in non-uniform fields of concentration.** LANDAHL, H. D. *Bull. Math. Biophys.*, 4, *pp.* 155–158, *Dec.*, 1942.—The special case of a metabolizing cell, with infinite permeability, suspended in the field of an equivalent cell is treated to determine its equilibrium shape for small deformations.

817 532.612 : 576.355

**An analysis of the shapes of a cell during division with particular reference to the rôle of surface tension.** LANDAHL, H. D. *Bull. Math. Biophys.*, 4, *pp.* 151–154, *Dec.*, 1942.—An expression is given for the contribution to the rel. elongation by any volume element or its surface. The case in which only a const. surface tension is acting is considered. From measurements of an egg in several stages, the empirical variation of an expression $\propto$ the above function is obtained. In the constricting region and near the ends of the cells, the change of shape is opposite to that which would be due to a const. surface tension alone. The effect of streaming which may arise from a variable surface tension is considered.

818 532.68 : 631.432

**Capillary rise and capillary movement of moisture in fine sands.** CARMAN, P. C. *Soil Sci.*, 52, *pp.* 1–14, 1941. *Abstr. in Build. Sci. Abstr.*, *p.* 139, *Sept.*,

1942.—The min. pressure necessary to force a liquid downward through sand or soil is determined. From data obtained, and the particle size and porosity, the capillary rise can be calculated. Data for the rise of water and various organic liquids are given.

E. R. A.

819 532.712 : 578.08

**Determination of the osmotic pressure of biological fluids.** ASCHAFFENBURG, R. *Nature, Lond.*, 151, *pp.* 169–170, *Feb.* 6, 1943.

820 533.15

**The coefficients of thermal diffusion of neon and argon and their variation with temperature.** STIER, L. G. *Phys. Rev.*, 62, *pp.* 548–551, *Dec.* 1 *and* 15, 1942.—In a mixture of 2 isotopic molecules, $D$, the coeff. of ordinary diffusion, and $D_T$, the coeff. of thermal diffusion, are related by the equation: $D_T/D = \alpha C_1 C_2$, where $C_1$ and $C_2$ are the rel. conc. of the molecules, and $\alpha$ is the thermal diffusion const. Exp. values of $\alpha$ for Ne and A in 7 different temp. intervals from 90°–720°K. are given; $\alpha$ varies linearly with the log. of the abs. temp. These results are compared with values from viscosity data and measurements made on binary mixtures of the noble gases.

821 533.15 : 533.7

**Separation of gas mixtures by thermal diffusion.** LEAF, B., AND WALL, F. T. *J. Phys. Chem.*, 46, *pp.* 820–826, *Oct.*, 1942.—Exp. results are compared with theory.

822 533.5

**Tire valve in vacuum application.** BACHMAN, C. H., AND BENSIN, I. B. *Rev. Sci. Instrum.*, 13, *pp.* 534–535, *Dec.*, 1942.

823 533.5

**Vacuum regulator.** *J. Sci. Instrum.*, 20, *p.* 17, *Jan.*, 1943.

*See Abstr.* 821 533.7 : 533.15

## SOUND. VIBRATIONS

824 534.111

**The transverse vibrations of a helical spring with pinned ends and no axial load.** DICK, J. *Phil. Mag.*, 33, *pp.* 513–519, *July*, 1942.—Analysis shows that 2 types of vibration are present. In the first the transverse deflection due to elastic bending and that due to transverse shear forces have the same sign at any instant. In the second type these deflections are always of opposite sign, the shear deflection being the larger. Exact and approx. expressions are found for the frequencies of the vibrations incl. harmonics.

G. E. A.

825 534.113

**Vibration of a thin vertical cantilever caused by a damped harmonic disturbance of the ground.** BORN, M., AND PUGH, H. L. D. *J. Instn Civ. Engrs*, 18, *pp.* 279–293, *June*, 1942.—The lower end of the cantilever is assumed clamped in the earth, and a solution is obtained synchronous with the perturbing force. The bending moment at the foot of the cantilever follows the same time law as the perturbing motion with a phase difference. The total b.m. includes a resonance factor which represents the elastic properties of the cantilever. The form of the factor indicates the immediate and after-effects of the disturbance; the synchronous vibration is alone present in the initial stage of the motion and excites the free vibrations gradually, these outlasting the forced vibrations. A given earth wave will have no appreciable effect unless it be near one of the proper frequencies.

G. E. A.

826 534.12 : 539.384.2

**Free and forced oscillations of continuous beams: treatment by the admittance method.** DUNCAN, W. J. *Phil. Mag.*, 34, *pp.* 49–63, *Jan.*, 1943.—The method is applied to the steady oscillation of a continuous beam, due to normal simple harmonic forces, with end thrust or tension present or absent. The method leads to a theorem of 3 moments, and, when impressed forces are absent, the equation of 3 moments is homogeneous in the amplitudes of the b.m. at the supports, while the coeff. are functions of the frequency. The eliminant of the set of such 3 moment equations is the frequency equation for the free oscillations of the beam.

827 534.13 : 539.431 : 621.833

**An investigation of the failure of a single helical geared turbine system due to combined axial and torsional vibration.** DOREY, S. F., AND FORSYTH, G. H. *Trans. Instn Nav. Archit., Lond.*, 84, *pp.* 207–220; *Disc.*, 220–227, 1942.—If the natural frequency of the combined vibration divided by the r.p.m. of the pinion shaft gives an integer, then patterned pinion wear quickly results, this being followed by pinion failure. Methods of avoiding this form of failure are discussed.

828 534.13 : 621.313

**Study of machinery vibration.** SEYMOUR, H. *Electrician*, 129, *pp.* 691–692, *Dec.* 25, 1942.

*See Abstr.* 792 534.131 : 517.63

829 534.141.4

**Edge tones.** JONES, A. T. *J. Acoust. Soc. Amer.*, 14, *pp.* 131–139, *Oct.*, 1942.—Using a wedge of abou 25° and a slit width of 0·7 to 0·8 mm., the autho finds, with variation of slit-edge distance $h$, 4 stage as in Brown's experiments [Abstr. 4620 (1937)] These fall into 2 types. In the first, at low win pressures, jumps in pitch occur; in the second th motion of the air is probably turbulent and the chang in pitch is continuous with change in $h$.

G. E. A

830 534.151

**A mechanical oscillator for recording compounde linear waves.** BULMAN, A. D. *J. Sci. Instrum.*, 20 *pp.* 10–12, *Jan.*, 1943.—Describes the making of, an results obtained with, a teaching device for demon stration of various wave phenomena, combinin oscillations both linearly and rectilinearly.

831 534.22 : 541.57

**Velocity of sound as a bond property.** LAGEMANN R. T., AND CORRY, J. E. *J. Chem. Phys.*, 10, *p.* 75 *Dec.*, 1942.—[See Abstr. 2379 (1941)].

832 534.42 : 621.396.99 : 681.89 = 3

**Sounds old and new by electrical musical instru ments.** BODE, H. *Bull. Ass. Suisse Élect.*, 33 *pp.* 479–483, *Aug.* 26, 1942.—The methods of search tone and band-filter analysis of sounds are briefl described. The effect produced by the rise and fa of a note is part of the character of the note; e.g. if

gramophone record of a piano piece is played backwards it sounds like a harmonium. During the dying of a note on the piano there is an increase in the content of overtones. The presence of formants is taken into account. In the production of musical sounds by electrical methods, partials are combined according as analysis may reveal their number, pitch and damping, and the rel. magnitude of the formants. Diagrams and photos illustrate the paper; a wiring diagram is given of a circuit for the production of the sound of the French horn. Others illustrate the principle and structure of the melodium. G. E. A.

833 534.522.5 : 621.317.35 : 512.37 : 518.5

**Use of the mechanical multiharmonograph for graphing types of functions and for solution of pairs of non-linear simultaneous equations.** BROWN, S. L., AND WHEELER, L. L. *Rev. Sci. Instrum.*, 13, *pp.* 493–495, *Nov.*, 1942.—[See Abstr. 953 (1941)]. Mechanical means are described whereby types of equations may be graphically represented and non-linear simultaneous equations may be solved. The procedure requires, in each case, that the equation be changed to a trigonometric form by polar transformation. Graphs are shown to illustrate the processes involved.

834 534.642

**Notes on acoustic-impedance measurement.** SABINE, H. J. *J. Acoust. Soc. Amer.*, 14, *pp.* 143–150, *Oct.*, 1942.—A summary of information on the tube method of measuring acoustic impedance. Normal-incidence sound-absorption coeff. $\alpha_n$ are measured [Abstr. 295 (1914)]. By means of a movable microphone the difference in db betw. the max. and min. sound pressures in the standing wave is measured and $\alpha_n$ calculated. The ratio of the distance betw. the sample and the 1st pressure min. to the distance betw. the 1st and 2nd min. is measured, and from these data the resistive and reactive components of the impedance may be calculated. Practical details and data of the attainable accuracy are given. G. E. A.

835 534.75 = 3

**Sound reception in animals and human beings.** AUTRUM, H. *Naturwissenschaften*, 30, *pp.* 69–85, *Jan.* 30, 1942.—A comprehensive analysis of the physiology of the auditory mechanism of animals and human beings from a survey of the literature. The features dealt with embrace the different types of sound receivers (pressure, displacement), directional sensitivity, the binaural location of direction, the perception of body sounds, and the conduction and transformation, physical and physiological, of stimuli. H. G. S.

## OPTICS

836 535.13 = 4

**Extension of Fresnel's formulae.** MERCIER, R. *Helv. Phys. Acta*, 15, 6, *pp.* 515–518, 1942.—The dielectric constant $\varepsilon$ and permeability $\mu$ in Maxwell's equations are replaced by $u = c/\sqrt{\mu\varepsilon}$, the phase velocity, and $R = \sqrt{\varepsilon/\mu}$, the wave resistance. Using these constants, a generalization of Fresnel's formulae can be made. This leads to the fact that there is no reflection at the interface betw. two vitreous media of different refr. index, if the wave resistances are the same, and incidence is normal. If the media have the same refr. index, but different wave resistances, the intensity of the reflected ray is indep. of the azimuth of polarization and of the angle of incidence. A. J. M.

837 535.243-1 : 544.6

**A rapid infra-red analytical method for hydrocarbon mixtures and a routine spectrophotometer for plant control.** BRATTAIN, R. R., AND BEECK, O. *J. Appl. Phys.*, 13, *pp.* 699–705, *Nov.*, 1942.—A rapid routine method has been developed for the analysis of simple mixtures of hydrocarbons. The instruments devised have proved sufficiently sturdy to be used for control work in plant operation and, by basing the analysis on an empirical calibration, calculations are reduced to a min. The instruments are simple and allow of the use of large spectral slit widths, thus eliminating the necessity for amplification of thermopile output energy and determination of any continuous absorption curve. A. H.

838 535.245 : 77.022

**The control of photographic printing by measured characteristics of the negative.** JONES, L. A., AND NELSON, C. N. *J. Opt. Soc. Amer.*, 32, *pp.* 558–619, *Oct.*, 1942.—A mass of data rel. to the characteristics of objects, negative materials, negatives, positive materials and positives, including some thousands of print-quality judgments, has been treated statistically in an endeavour to obtain simple general relationships. The max. print density is on the average below the available density of the positive material. The min. density is frequently zero and often the extreme highlight of the object is forced right off the characteristic curve of the positive material. A. H.

839 535.247.4 : 535.37 : 621.385.8

**An electronic method of measuring molecular lifetimes.** RAWCLIFFE, R. D. *Rev. Sci. Instrum.*, 13, *pp.* 413–418, *Oct.*, 1942.—An apparatus is described for following in detail changes in light intensity in times of the order of 1 $\mu$sec. The light to be measured falls on an electron multiplier tube which is connected to a c.r.o., on which the decay curves and a time scale are observed. In measuring fluorescence, a square pulse of exciting light is produced by a Kerr cell whose p.d. is controlled by the sweep circuit. With the N discharge tube in place of the Kerr cell, photographs were taken at several pressures of the decay of the light of red and blue band systems, and of the discharge tube current which decreases more rapidly than the light.

*See Abstr.* 879 535.3 : 536.49 : 548 : 537.531 = 4

840 535.322.1

**A simple crystal-rotating device for use on a fibre spectrometer.** HAPPEY, F., AND PORTER, A. W. *J. Sci. Instrum.*, 20, *p.* 15, *Jan.*, 1943.

841 535.323

**Refractive index of coals.** CANNON, C. G., AND GEORGE, W. H. *Nature, Lond.*, 151, *pp.* 53–54, *Jan.* 9, 1943.

*See Abstr.* 814 535.324 : 532.14 : 532.612

*See Abstr.* 846 535.33.03 : 535.338.332

842 535.33.071 = 3

**On a method of determination of rapidly changing spectra.** MAEDER, D., AND MIESCHER, E. *Helv. Phys. Acta*, 15, 6, *pp.* 511–513, 1942.—An older method, in which a rotating shutter was used, is improved by the use of a rotating mirror in place of the

shutter. In this way a spectrum can be photographed which may exist for only $10^{-5}$ sec. The absorption spectrum of the radical BCl (life period approx. $10^{-3}$ sec.) has been obtained by the method. A. J. M.

843 535.331 : 669.18

**A critical consideration of some applications of the spectrograph to steelworks analysis.** SHIRLEY, H. T., AND ELLIOTT, E. *J. Iron Steel Inst.*, [25 *pp.*], 1943. *Advance copy.*

844 535.331.03 : 544.6

**Spectrochemical determination of silicon, iron and aluminium in mineral powders with a high-voltage direct-current arc.** OSHRY, H. I., BALLARD, J. W., AND SCHRENK, H. H. *J. Opt. Soc. Amer.*, 32, *pp.* 672–680, *Nov.*, 1942.—The technique developed for determining the composition of atmospheric contamination has been tested against analysed samples and found to give an accuracy of 5%. Excess of Ni oxide acts both as a spectroscopic buffer and an internal std. whilst graphite powder improves uniformity of burning and obviates spattering. As source of power a full-wave rectified 2 200 V arc is employed, this completely volatilizes mineral samples. A. H.

845 535.331.03 : 544.6

**Quantitative spectroscopy applied to some impurities in 70–30 cupro-nickel.** FRANCE, W. D. *J. Opt. Soc. Amer.*, 32, *pp.* 681–685, *Nov.*, 1942.—The spectrographic determination of Zn, Fe and Pb in cupro-nickel is described. Handled chemically, these determinations make the analysis lengthy, and it is shown that an accuracy ample for passing or rejecting samples according to specification is readily obtained spectrographically. A. H.

846 535.338.332 : 535.33.03

**Arc spectrum of bismuth Bi I.** MROZOWSKI, S. *Phys. Rev.*, 62, *pp.* 526–533, *Dec.* 1 *and* 15, 1942.—The light source consisted of a heated quartz tube containing Bi metal, filled with a few mm. of He and excited by a 4 m. oscillator. At high v.p. of Bi only the arc spectrum is excited and is so intense that many new lines were studied. Pictures were obtained which show in the third order a resolution of 400 000, the highest ever obtained with a grating.

847 535.338.4

**A new band spectrum associated with nitrogen.** GAYDON, A. G. *Nature, Lond.*, 151, *pp.* 167–168, *Feb.* 6, 1943.

848 535.339

**A monochromator using a large water prism.** CANNON, C. V., AND RICE, O. K. *Rev. Sci. Instrum.*, 13, *pp.* 513–514, *Dec.*, 1942.—An inexpensive monochromator, capable of giving high intensity in the near ultra-violet, is described. A large water prism with quartz sides has an internal reflection so that the beam comes through at min. deviation, and gives straight undistorted spectral lines at the exit slit.

849 535.34 = 3

**On a standard substance for determination of optical absorption.** HALBAN, H. VON, AND WIELAND, K. *Helv. Phys. Acta*, 15, 6, *pp.* 525–526, 1942.—The conditions to be satisfied by a std. substance in optical-absorption determinations are laid down. Such a substance must have a suitable absorption spectrum in the range of working, it must easily be obtained pure, and must be perfectly stable in the solid state, and stable for some time in solution. Its solution must obey Beer's law in the conc. range in which it is to be used. The substance recommended is astraphloxin perchlorate. A. J. M.

850 535.343 : 535.372

**Spectroscopic studies of the simpler porphyrins. IV. The absorption and fluorescence spectra of *ms*-tetra(3′,4′-methylenedioxyphenyl)porphine of HCl number four and of its $AgC_5H_5N$, Zn and Ni complex salts.** ALBERS, V. M., KNORR, H. V., AND FRY, D. L. *J. Chem. Phys.*, 10, *pp.* 700–705, *Dec.*, 1942.—The molecular absorption coeff. of *ms*-tetra(3′,4′-methylenedioxyphenyl)porphine and the $AgC_5H_5N$, Zn and Ni complex salts, were measured over the visible region. Curves repr. the absorption coeff. as a function of the wavelength are shown. The spectra of this porphyrin and its metal complex salts are similar to those of *ms*-tetraphenylporphine and its corresp. salts. All four substances fluoresce in the red region. Curves of rel. intensity of fluorescence *v.* wavelength are shown for the parent substance and the Zn complex salt.

851 535.343-1 : 535.375.5

**Infra-red and Raman spectra of polyatomic molecules. XVII. Methyl-$d_3$-alcohol-$d$ and Methyl-$d_3$-alcohol.** NOETHER, H. D. *J. Chem. Phys.*, 10, *pp.* 693–699, *Dec.*, 1942.—$CD_3OD$ and $CD_3OH$ were prepared and their infra-red spectrum from 2·5 $\mu$ to 18 $\mu$ measured. The Raman spectrum of $CD_3OD$ was observed. $CH_3OH$ and $CH_3OD$ were reinvestigated and an assignment for all 4 methyl alcohols is given. [See Abstr. 229, 2052, 4525 (1938)].

852 535.37 = 3

**The law of decay of the phosphorescence of alkali halogen and silicate phosphors.** BIRUS, K., AND ZIEROLD, H. *Naturwissenschaften*, 30, *pp.* 63–64, *Jan.* 23, 1942. H. G. S.

853 535.37 : 621.317.49 : 620.19

**Fluorescent materials.** *Rev. Sci. Instrum.*, 13, *p.* 467, *Oct.*, 1942.—[See Abstr. 669 B (1943)].

*See Abstr.* 839 535.37 : 621.385.8 : 535.247.4

854 535.371 : 581.142 = 4

**Effect of fluorescence on germination.** CHODAT, F., AND WEBER, C. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 28–32), 1942.—The case where fluorescence is induced by artificial adsorption of a fluorochrome at the surface of the cell, or by its penetration into the interior, is examined, the seeds being treated with berberine sulphate. The seeds were then irradiated with ultra-violet light. The presence of the fluorochrome reduces the stimulating effect of the ultra-violet on germination. Where a seed would be damaged by excess irradiation with ultra-violet, the fluorochrome provides some protection. A. J. M.

855 535.371 : 622 : 669

**A study of the phenomenon of fluorescence.** GOLSON, G. A. *Min. Mag.*, 32, *pp.* 110–114, *March*; 159–161, *and* 168, *April, and pp.* 224–226, *May*, 1942.—Part I, on the nature of the phenomenon, briefly covers the

history, types and physical theory of fluorescence. Part II deals with the technique of the examination of minerals under fluorescent lighting and describes the sources of ultra-violet light, and associated filters, which are used. Part III is concerned with applications in mining and metallurgy, as in the mining of tungsten, zinc and other metals, but also includes a brief review of applications in other industries. The article includes a list of some of the more important industrial minerals giving the colour of fluorescence in each case. A. E. T.

*See Abstr.* 850 535.372 : 535.343

856 535.375.5

**Raman-effect investigations of aqueous solutions of potassium hydrogen fluoride and hydrofluoric acid.** WOODWARD, L. A., AND TYRRELL, H. J. V. *Trans. Faraday Soc.*, 38, *pp.* 513–517, *Nov.–Dec.*, 1942.—An efficient type of Raman apparatus suitable for use with solutions containing HF is described. No effect is observed with conc. aq. solutions of $KHF_2$. This is taken as evidence in support of Pauling's view that the H bonds are ionic in character. A 40% aq. solution of HF shows an intense continuous spectrum; this is due to fluorescence. Its presence precludes the observation of a Raman effect.

*See Abstr.* 851 535.375.5 : 535.343-1

857 535.392 : 595.7

**An electron-microscope study of some structural colours of insects.** ANDERSON, T. F., AND RICHARDS, A. G., JR. *J. Appl. Phys.*, 13, *pp.* 748–758, *Dec.*, 1942.—Two types of structures were studied. The iridescence of the beetle *Serica sericea* is due to a line grating on its wing-covers, 0–8 $\mu$ betw. lines. The structure giving rise to the brilliant blue colour of *Morpho cypris* consists essentially of hundreds of vanes on each wing scale, the vanes possessing linear thickenings 0·2 $\mu$ apart which reinforce the reflection of blue light. Numerous exceedingly fine markings on parts of the wing scales go down in dimensions to 60 Å, and some of them may be related to the chemical structure of the scales. Chemical tests show that the scales are not composed of chitin. Bombardment of the scales with an intense electron beam does not appreciably affect the swelling properties of the scales in organic liquids.

858 535.6 : 75

**Inter-Society Colour Council symposium.** *J. Opt. Soc. Amer.*, 32, *pp.* 698–726, *Dec.*, 1942.—Colour in art education, Judd, D. B.; Emotions *v.* measurement in teaching colour, Meier, N. C.; Colour-mixing systems. Colour *v.* colorant mixture, Dohner, D. R., and Foss, C. E. [Abstr. 859 (1943)]; Colour-order systems, Munsell and Ostwald, Bond, M. E., and Nickerson, D. [Abstr. 860 (1943)]; Results of a questionnaire on colour in art education, Farnum, R. B.

859 535.64

**Colour-mixing systems: Colour *v.* colorant mixture.** DOHNER, D. R., AND FOSS, C. E. *J. Opt. Soc. Amer.*, 32, *pp.* 702–708, *Dec.*, 1942.—Describes in general terms the principles of colour mixture and the use of the colour triangle. The distinction between mixtures of colour (additive) and mixtures of colorants (subtractive) is emphasized. J. W. T. W.

860 535.65

**Colour-order systems, Munsell and Ostwald.** BOND, M. E., AND NICKERSON, D. *J. Opt. Soc. Amer.*, 32, *pp.* 709–719, *Dec.* 1942.—Gives a full description in general terms of the Ostwald and the Munsell systems of colour description and points out the relative advantages of each. It is concluded that for the purposes of a specification the Munsell system is superior, although for art teachers the Ostwald system is often preferred. J. W. T. W.

## HEAT. THERMODYNAMICS

861 536.2 : 537.226 = 82

**Thermal conductivity of paramagnetic dielectrics at low temperatures, and thermal conductivity of dielectrics at temperatures above the Debye temperature.** POMERANCHUK. *J. Exp. Theoret. Phys., U.S.S.R.*, 11, 2–3, *pp.* 226–254, 1941. *Abstr. in Wireless Engr*, 19, *p.* 490, *Oct.*, 1942.

862 536.2(091)

**A review of recent progress in heat transfer.** LANDER, C. H. *J. Proc. Instn Mech. Engrs, Lond.*, 148, *pp.* 81–112, *Jan.*, 1943.—Discusses the growth of knowledge since 1909 and the fields of application. Selected cases dealt with are: forced convection for banks of tubes and beds of broken solids, and the relation between heat transfer and friction; natural convection from vertical and horizontal surfaces and across fluid layers; heat transfer in the drop and film condensation of steam, and in film and nucleate boiling; evaporation and its relation to convection; emissive powers of surfaces for radiation; and radiation from non-luminous gases.

863 536.2.08 : 536.33

**Effect of radiation upon thermal conductivities determined by hot plates.** JOHNSTON, R. M., AND RUEHR, C. B. *Heat. Pip. Air Condit.*, 13, 5, *pp.* 325–326, 1941. *Abstr. in Build. Sci. Abstr.*, *p.* 143, *Sept.*, 1942.—An investigation was made to account for variations in conductivity values obtained for the same material by the guarded-hot-plate method when using different plates, i.e. Cu or Al surfaces, or those made of refractory material. The effects of surface emissivity of the plate, and of the mean temperature at which the test was made, were determined. E. R. A.

864 536.212 : 517.942.82

**Heat conduction in a wedge, or an infinite cylinder whose cross-section is a circle or a sector of a circle.** JAEGER, J. C. *Phil. Mag.*, 33, *pp.* 527–536, *July*, 1942.—A theoretical treatment which is applicable to the heating of whole or split logs of wood when dried in a const. temperature enclosure. The Laplace transformation method is used to obtain a solution for the case of a wedge, and numerical results are given for wedges of angles $2\pi$, $\pi/2$ and $3\pi/2$. The corresponding problem for the sector of a circle is discussed and numerical results are given for sectors of angles $2\pi$, and $\pi/2$. The point of the sector which heats most slowly is determined as well as its rate of heating. The practical case of wood for which the conductivities in the radial and tangential directions are different is shown to be reducible to the case where the two conductivities are the same. Tabulated values for a circular cylinder are included. R. W. P.

*See Abstr.* 863 536.33 : 536.2.08

865 536.33 : 66.041

**Radiation configuration factors using light in furnace models.** ENGLAND, F., AND CROFT, H. O. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 691–702, *Oct.*, 1942.—In problems involving the exchange of heat energy by radiation betw. bodies, it is necessary to know what areas of the bodies in question "see each other." Those factors expressing mutual visibilities are known as configuration factors. The paper introduces an exp. method of determining configuration factors by employing models of furnace cavities and utilizing the exchange of light energy instead of heat energy.

866 536.423.15 : 536.75 : 539.155.2

**The differences in the vapour pressures and entropies of the liquid nitrogens.** KIRSHENBAUM, I. *J. Chem. Phys.*, 10, *pp.* 717–722, *Dec.*, 1942.—The differences in the thermodynamic properties of liquid $N_2^{14}$ and $N_2^{15}$ are discussed on the basis of several Debye-like models. The quantum-mechanical effects are greater than expected from an harmonic oscillator model.

867 536.423.4 : 537.312 : 621.186

**An electrical detector of condensation in high-velocity steam.** BINNIE, A. M., AND GREEN, J. R. *Proc. Roy. Soc. A*, 181, *pp.* 134–154, *Dec.* 31, 1942.—When a short length of fine wire, mounted on a rod, was traversed axially through the nozzle, its resistance altered sharply at a certain point. The position of this point agreed closely with that of a small sudden pressure rise in the nozzle [Abstr. 2565 B (1938)], which indicates the beginning of condensation of the supersaturated steam. The mean temperature of the wire upstream from this point was nearly the same as that of the steam at entrance to the nozzle.

*See Abstr.* 879 536.49 : 548 : 535.3 : 537.531 = 4

868 536.631 : 536.75

**The specific heat of pure iron at low temperatures.** KELLEY, K. K. *J. Chem. Phys.*, 11, *pp.* 16–18, *Jan.*, 1943.—Sp. ht. of 99·94% pure Fe was measured in the range 52°–298°K. Results are considered accurate to within 0·3%. The entropy was computed as $S_{298\cdot16} = 6\cdot49 \pm 0\cdot03$ cal./deg. (g.atom), of which only $4 \times 10^{-4}$ is extrapolation below 1°K.

869 536.631 : 548

**The heat capacities of molecular lattices. III. Some simple molecular solids.** BRUCKSCH, W. F., JR., AND ZIEGLER, W. T. *J. Chem. Phys.*, 10, *pp.* 740–743, *Dec.*, 1942.—The experimental heat capacity data for crystalline $Cl_2$, $CO_2$, $SO_2$, SCO, $N_2O$, $C_2N_2$, $C_6H_6$, $C_2H_4$ and $CH_3Br$ are compared with the results of calculations [Abstr. 4118 (1937) and 2355 (1941)]. Good agreement is obtained.

870 536.71 : 539.31 : 678

**Equations of state for natural and synthetic rubber-like materials. I. Unaccelerated natural soft rubber.** ANTHONY, R. L., CASTON, R. H., AND GUTH, E. *J. Phys. Chem.*, 46, *pp.* 826–840, *Oct.*, 1942.—The existence of the inversion point in the stress/temperature curves is due to ordinary volume expansion and may be eliminated by correcting for this thermal expansion. The change of entropy with elongation accounts for more than 90% of the total stress at room temperature, while the internal-energy contribution is $< 10\%$.

871 536.71 : 541.12

**An empirical equation for thermodynamic properties of light hydrocarbons and their mixtures. II. Mixtures of methane, ethane, propane and *n*-butane.** BENEDICT, M., WEBB, G. B., AND RUBIN, L. C. *J. Chem. Phys.*, 10, *pp.* 747–758, *Dec.*, 1942.—An empirical equation is given for the isothermal variation with density of the work content of hydrocarbon mixtures in the gaseous or liquid state. From this are derived (*a*) an equation of state, (*b*) an equation for the fugacity, (*c*) an equation for the isothermal variation of the enthalpy, and (*d*) an equation for the isothermal variation of the entropy. [See Abstr. 1878 (1940)]. Methods are proposed for determining the parameters in the equation for mixtures from the parameters in the equation for pure hydrocarbons. A comparison is made betw. observed and predicted properties of mixtures.

872 536.75

**Nature of entropy.** CAMPBELL, I. D. *Nature, Lond.*, 151, *pp.* 138–139, *Jan.* 30, 1943.

*See Abstr.* 868 536.75 : 536.631

*See Abstr.* 866 536.75 : 539.155.2 : 536.423.15

## ELECTRICITY. MAGNETISM

*See Abstr.* 861 537.226 : 536.2 = 82

873 537.228.1 : 539.32 : 548 = 3

**Effect of temperature on the dynamic-elastic behaviour of substances like Rochelle salt.** LÜDY, W. *Helv. Phys. Acta*, 15, 6, *pp.* 527–552, 1942.—A new method using a c.r.o. and frequency modulator was used to determine, for Rochelle salt and for $KH_2PO_4$, how the natural frequency depends on temperature. The moduli of elasticity of both substances were calculated. The effect of the air gap betw. crystal and electrode and the behaviour at the Curie temperatures are specially dealt with. When used with an air gap the moduli of elasticity of Rochelle salt at 20°C. were $S_{11} = 5\cdot4 \times 10^{-12}$, $S_{22} = 3\cdot7 \times 10^{-12}$, $S_{33} = 3\cdot4 \times 10^{-12}$ cm.²/dyne, and of $KH_2PO_4$; $S_{11} = S_{22} = 1\cdot9 \times 10^{-12}$, $S_{33} = 2\cdot2 \times 10^{-12}$ cm.²/dyne. These const. show no anomalous behaviour at the Curie points. Without an air gap, when the crystal oscillations are damped by the contact electrodes, anomalous effects at the Curie points are very pronounced. A. W.

*See Abstr.* 907 537.228.1 : 621.317.39 : 621.396.611.21 : 539.32

874 537.311.32 : 621.315.613.8 = 82

**The electrical conductivity of alumina at high temperatures.** SHUL'MAN. *J. Techn. Phys., U.S.S.R.*, 10, 14, *pp.* 1173–1182, 1940. *Abstr. in Wireless Engr*, 19, *p.* 490, *Oct.*, 1942.—Experiments were conducted with $Al_2O_3$ from 700° to 2 200°K. A number of exp. curves and Debye spectrograms are shown, and a theoretical interpretation of the results is given: a comparison is made with conclusions by other investigators. E. R. A.

875 537.311.33 : 621.316.86 : 621.314.63

**Contact non-linearity, with reference to the metal rectifier and the carborundum ceramic non-linear resistor.** FAIRWEATHER, A. *J. Instn Elect. Engrs*,

9, *Part I*, *pp.* 499–518, *Nov.*, 1942.—[Abstr. 711 B 1943)].

876 537.312

**Electrical resistance of wood.** BARKAS, W. W., BEARMON, R. F. S., AND PRATT, G. H. *Nature, Lond.*, 151, *p.* 83, *Jan.* 16, 1943.

*See Abstr.* 867 537.312 : 621.186 : 536.423.4

877 537.523 : 621.3.015.51 = 3

**On the electric breakdown in gases.** RAETHER, H. [*ETZ [Elektrotechn. Z.]*, 63, *pp.* 301–303, *July* 2, 1942.—See Abstr. 681 B (1943)].

878 537.529 : 548 = 82

**The electrical breakdown of insulating crystals.** VOROBJEV. *J. Techn. Phys., U.S.S.R.*, 10, 14, *pp.* 1183–1188, 1940. *Abstr. in Wireless Engr*, 19, p. 490, *Oct.*, 1942.

879 537.531 : 535.3 : 536.49 : 548 = 4

**Theory of the influence of thermal vibrations on the reflection of X-rays by crystals.** BLEULER, K., AND WEIGLE, J. *Helv. Phys. Acta*, 15, 6, *pp.* 553–570, 1942.—A more exact treatment than the previous one, [Abstr. 1577, 3074 (1942)], which takes account of the interaction of the thermal waves. The phenomena are discussed with resp. to their effects on the reciprocal ("Fourier" lattice). No new results are claimed but the previous results of Faxén and Waller are corroborated. J. T.

880 537.533/.534 : 621.384

**The electrostatic focusing of high-speed ion and electron beams.** CRAGGS, J. D. *J. Appl. Phys.*, 13, *pp.* 772–780, *Dec.*, 1942.—A description of tests carried out in preparation for the construction and development of an apparatus for artificial atomic disintegrations. The problems involved are (i) the focusing of a beam of 10 to 30 ekV H ions from a canal-ray ion source (glow discharge type) and (ii) the behaviour of a cascade acceleration tube of the Coolidge type. The general properties of electrostatic focusing systems are treated briefly, and references are given. In view of the aberrations present, the const. of the lenses cannot be accurately calculated. Several lens systems were used and details are given in tables.

881 537.541 : 621.385.1

**Velocity-modulation currents.** WEBSTER, D. L. *J. Appl. Phys.*, 13, *pp.* 786–787, *Dec.*, 1942.—Amplifying statement [Abstr. 3463 (1939)].

882 537.564

**Ionization in hydrogen by fast hydrogen neutrals.** CRAGGS, J. D. *Nature, Lond.*, 151, *pp.* 137–138, *Jan.* 30, 1943.

883 537.582

**Evidence of a periodic deviation from the Schottky line. II.** PHIPPS, T. E. *Phys. Rev.*, 62, *pp.* 554–555, *Dec.* 1 *and* 15, 1942.—Note and Erratum. [See Abstr. 4424 (1939)].

884 537.591.15

**On the theory of cosmic-ray showers. II. Further contributions to the fluctuation problem.** SCOTT, W. T., AND UHLENBECK, G. E. *Phys. Rev.*, 62, *pp.* 497–508, *Dec.* 1 *and* 15, 1942.—Further calculations on the distribution in size of cosmic-ray showers. [See Abstr. 1528 (1940)]. This distribution is determined when the average energy distribution of the particles in a shower is known. The fluctuations are small and = twice the Poisson value for all values of the thickness. The calculations of the fluctuation are extended to the actual cosmic-ray problem.

885 537.591.3

**Cloud-chamber track of a decaying mesotron.** SHUTT, R. P., DEBENEDETTI, S., AND JOHNSON, T. H. *Phys. Rev.*, 62, *pp.* 552–553, *Dec.* 1 *and* 15, 1942.—[See Abstr. 1839 (1942)].

886 538.3

**Force required to give a small acceleration to a slowly-moving sphere carrying a surface charge of electricity.** SEARLE, G. F. C. *Phil. Mag.*, 33, *pp.* 889–899, *Dec.*, 1942.—The force required to accelerate a uniformly charged sphere in a fixed direction can be dealt with if the motion is treated as "quasi-stationary," and the theory is simplified by restricting the velocity to be very small compared with that of light, and making the acceleration vanishingly small. Three methods of investigation are given. A note is added for the case of finite velocity and acceleration. A. J. M.

887 538.67

**Magnetization of matter by ultra-violet radiation.** MARTIN, S. L., AND CONNOR, A. K. *Nature, Lond.*, 151, *p.* 167, *Feb.* 6, 1943.

## MOLECULAR AND ATOMIC PHYSICS

888 539.132

**Quantization of molecules.** FAJANS, K. *J. Chem. Phys.*, 10, *pp.* 759–760, *Dec.*, 1942.

889 539.132

**Stabilization and binding of quantized radicals.** FAJANS, K. *J. Chem. Phys.*, 10, *p.* 761, *Dec.*, 1942.

890 539.132

**The wave function for the negative hydrogen ion.** WILLIAMSON, R. E. *Phys. Rev.*, 62, *pp.* 538–539, *Dec.* 1 *and* 15, 1942.—A 6-parameter wave function for the H ion is derived and several tests for the goodness of a wave function applied.

891 539.152.1

**The polarizability of $H^-$.** HENRICH, L. R. *Phys. Rev.*, 62, *pp.* 545–547, *Dec.* 1 *and* 15, 1942.—The value for the polarizability of $H^-$ is computed from both 3rd- and 6th-order Hylleraas-type wave functions. It is found to be $11{\cdot}58 \times 10^{-24}$ and $14{\cdot}63 \times 10^{-24}$, respectively, in c.g.s. units.

892 539.152.1

**Spin inversion processes and nuclear spectroscopy.** BECK, G., AND MARTINS, J. L. R. *Phys. Rev.*, 62. *p.* 554, *Dec.* 1 *and* 15, 1942.

*See Abstr.* 866 539.155.2 : 536.75 : 536.423.15

*See Abstr.* 971 539.16 : 550.42

893 539.16.08

**Localization of the discharge in G-M counters.** WILKENING, M. H., AND KANNE, W. R. *Phys. Rev.*, 62, *pp.* 534–537, *Dec.* 1 *and* 15, 1942.—The reduction of the field in the counter by surface charges accumulated on an insulator interrupts the spread of the discharge. This implies strong photon absorption in the gas of the fast counter. The eff. of localization

was investigated as a function of the conc. of alcohol in an argon-alcohol filling. Localization is more complete at low values of over-voltage. The effectiveness of various gas fillings is given.

894 539.162

**Note on a paper "On the theory of successive radioactive transformations."** SEDGWICK, W. F. *Proc. Camb. Phil. Soc.*, 39, *p.* 68, *Jan.*, 1943.

895 539.163 : 550.4

**The "age" of terrestrial matter and the geochemical uranium/lead ratio.** KOCZY, F. F. *Nature, Lond.*, 151, *p.* 24, *Jan.* 2, 1943.

896 539.163.2

**The beta-ray spectrum of antimony (124).** HALES, E. B., AND JORDAN, E. B. *Phys. Rev.*, 62, *pp.* 553–554, *Dec.* 1 *and* 15, 1942.

897 539.181.08 : 778.31

**The photographic plate in nuclear physics.** POWELL, C. F. *Endeavour*, 1, *pp.* 151–156, *Oct.*, 1942.—Possible uses of the half-tone photographic emulsion in the detection of the products of nuclear disintegrations are suggested. It is claimed that the plate is not inferior to the counter as a detector of charged particles, and is preferable to the cloud chamber in the determination of the energy of fast neutrons. It can also be used to check the mass values determined by the mass spectrograph and in examining the excited states in nuclei. The scattering of protons and deutrons can be successfully recorded. M.-V.

898 539.185

**The diffusion length of C neutrons in water.** GAMERTSFELDER, G. R., AND GOLDHABER, M. *Phys. Rev.*, 62, *pp.* 556–557, *Dec.* 1 *and* 15, 1942.

899 539.214.07 : 679.5

**Recording plastometer.** BONDI, F. J. *Bell. Lab. Rec.*, *pp.* 18–19, *Sept.*, 1942.—A description is given of a simple, self-recording instrument for the measurement of the variation of the flow properties of plastics with physical factors such as moisture content and temperature. The specimen is deformed by a known force and the decrease in height with time is recorded. M.-V.

900 539.215.4 : 771.5

**An instrument for the measurement of graininess.** ROMER, W., AND SELWYN, E. W. H. *Photogr. J.*, 82, *pp.* 17–20, *Jan.*, 1943.—An enlarged image of the material under examination is thrown upon a test-object comprising a series of sets of test-patterns of low contrast. The size of test-pattern at which half the test-patterns of a set are unrecognizable is found to be ∝ the statistical average irregular fluctuation of density from point to point of the grainy material.

901 539.216 = 4

**Study of the rolling of fibre ribbons.** GOOSSENS, L. *Schweiz. Arch. angew. Wiss. Techn.*, 7, *pp.* 273–285, *Oct., and pp.* 325–334, *Nov.*, 1941.—This paper contains a mathematical treatment of the problem of rolling which, although only approx. in character, should serve as a guide for the construction of rolling machines. Practical rules are included, based on experience in industry, and dep. on the nature of the raw materials employed, the methods of manufacture and the types of machines in use. H. H. HO.

902 539.217.1

**The practical determination of air-filter efficienc** DUFTON, A. F., AND BILLINGTON, N. S. *J. Instn Hea Vent. Engrs*, 10, *pp.* 180–185, *Oct.–Nov.*, 1942.—Di cusses problems of determining air-filter eff. and giv details of a laboratory method for testing. A no is given on portable apparatus for field work on lar commercial filters, and the two techniques are con pared. E. R.

903 539.217.3 : 679.5 : 620.193.19

**Water absorption on moulded high-impact-resistin materials.** AZAM, M. A., AND LUCE, F. *Brit. Plast* 14, *p.* 332, *Nov.*, 1942.—Gives the results of tests mad to determine the effect of surface scratches upon wate absorption of moulded high-impact materials. E. R.

904 539.26 : 548

**Crystal photography with divergent X-rays.** LON DALE, K. *Nature, Lond.*, 151, *p.* 52, *Jan.* 9, 1943.

905 539.262

**Columbium foil as filter for Mo $K\beta$ radiatio** FREVEL, L. K., AND RINN, H. W. *Rev. Sci. Instrum.* 13, *p.* 504, *Nov.*, 1942.

## ELASTICITY. STRENGTH

906 539.31

**The elasticity of a network of long-chain mole cules. I.** TRELOAR, L. R. G. *Trans. Faraday Soc.*, 39 *pp.* 36–41, *Jan.*, 1943.—The treatment of the elasticit of a molecular network by the method of Wa [Abstr. 2869 (1942)] is discussed and compared wit the earlier treatment of Kuhn. It is shown that more accurate application of Kuhn's method leads t formulae for elongation and shear in agreement wit those of Wall.

*See Abstr.* 870 539.31 : 678 : 536.71

907 539.32 : 537.228.1 : 621.317.39 : 621.396.611.21

**A determination of the elastic constants of beta quartz.** KAMMER, E. W., AND ATANASOFF, J. V *Phys. Rev.*, 62, *pp.* 395–400, *Oct.*1 *and* 15, 1942.—A new technique is described for quickly locating an measuring weak resonance points of a plate of piezo electric material. The method involves driving th resonator with a f.m. carrier and demodulating an amplifying a voltage related to the motion of th resonator. The output of the amplifier is placed o one set of plates of an oscilloscope and the othe plates are charged with the modulating voltage This was employed with a dynamical method t determine all elastic constants of beta-quartz.

*See Abstr.* 873 539.32 : 548 : 537.228.1 = 3

908 539.378.3

**Diffusion rate of carbon in iron-cobalt alloys** SMOLUCHOWSKI, R. *Phys. Rev.*, 62, *pp.* 539–544 *Dec.* 1 *and* 15, 1942.—Certain elements have a def influence on the rate of diffusion of C in $\gamma$-iron Co shows a pronounced accelerating influence. Thi conclusion is confirmed by direct measurement an an increase in the diffusion coeff. established.

909 539.383

**Microscope observations of the crushing of coal** BODDY, R. G. H. B. *Nature, Lond.*, 151, *p.* 54 *Jan.* 9, 1943.

*See Abstr.* 826 539.384.2 : 534.12

910 539.388.8 : 677.31

**Modern methods of reducing the normal felting properties of wool and wool goods.** PHILLIPS, H. *J. Soc. Dy. Col., Bradford*, 58, *pp.* 245–253, *Dec.*, 1942.—In order to make wool non-felting it is necessary to alter the surfaces of the fibres; the depth to which this alteration is necessary is very small. The historical development of processes for making wool non-felting is considered, together with a brief review of the wet chlorination process. Newer methods are described, e.g. the use of organic hypochlorites, dry chlorination, sulphuryl chloride, nitrosyl chloride, alkali treatments, sodium sulphide and chlorine in aqueous solutions containing formic acid. The properties and testing of non-felting wool are dealt with, together with the determination of relaxation and felting shrinkage. Details of strength tests are given, and a discussion is included of the stage in manufacture at which wool should be made non-felting. H. H. HO.

911 539.389.1 : 669.14

**The yield point in steel.** EDWARDS, C. A., PHILLIPS, O. L., AND LIU, Y. H. *J. Iron Steel Inst.*, [23 *pp.*], 1943. *Advance copy.*—Explanations offered to account for the upper and lower yield points in mild steel during tensile testing are examined. The behaviour of mild steel in this respect is an intrinsic property of the material, and is not due to the inertia of the testing equipment. The value of the yield stress is affected by the rate of loading. No support is obtained for the hypothesis that the yield point is due to some kind of retardation in the ability of the metal to react to increasing stresses, if insufficient time is given for plastic deformation to be initiated, and that no yield point would be shown in mild steel if extremely slow rates of loading were used. The yield point in mild steel can no longer be attributed to the body-centred cubic lattice structure. When a yield point is obtained, it is associated with the presence of an element which is more soluble at high than at low temperatures, and with a treatment which causes this element to be precipitated on certain planes of slip within the crystals.

912 539.389.4 : 669.7

**A note on the "damping" characteristics of some magnesium and aluminium alloys.** STANTON, L. R., AND THOMPSON, F. C. *J. Inst. Met.*, 69, *pp.* 29–42, *Jan.*, 1943.—The damping capacities of some Mg alloys were measured at temperatures from — 50° to 280°C., and, for comparison, the damping capacities of 2 typical Al alloys were also determined. Mg alloys have a higher damping than Al alloys, and, for equal fibre stresses, both materials have greater damping capacities than steel. Both sets of alloys show a min. at a temperature below the normal room temperature. With the exception of Elektron AZ855, the damping capacity of the alloys decreases as the fibre stress is reduced.

913 539.4.01 : 620.115.842 : 620.171.3

**Effects of notching on strained metals. I and II.** SACHS, G., AND LUBAHN, J. *Iron Age*, *pp.* 31–38, *Oct.* 8, *and pp.* 48–52, *Oct.* 15, 1942.—Experimental work on the effects of notching on the physical properties of metals is reviewed. The effects of notch shape and size, the material tested, heat treatment, temperature and superposed bending are considered. Plastic flow and the ratio bew. transv. and long. stresses are discussed. Rupture tends to occur along a cleavage plane except in coarse-grained, brittle, polycrystalline metals. The various factors affecting cohesive stress are considered. M.-V.

914 539.4.019 : 620.1

**Effect of rate of loading on the mechanical properties of some materials.** EVANS, R. H. *J. Instn Civ. Engrs*, 18, *pp.* 296–306, *June*, 1942.—An investigation of the effect of rate of loading (*a*) on the crushing strength of rich and lean mixes of concrete and (*b*) on the yield-point, ultimate or tensile strength, percentage elongation and reduction of area of mild steel, duralumin and brass (Muntz metal) and the tensile strength of cast iron. The (*a*) specimens were cubes of aluminous cement and curves indicate for these an increase in crushing strength for speeds faster than 1/20 sec. Ductile materials differ in the manner in which the yield point and tensile strength vary with the rate of strain. Mild steel shows a marked increase in yield point in this respect but not so great in tensile strength, so that with a given rate of strain the two quantities become equal in magnitude. An explanation of this difference in property betw. steel and duralumin and brass is offered. G. E. A.

915 539.42 : 677 : 620.16

**Cloth strength testing.** *J. Text. Inst., Manchr*, 33, *pp.* 7–39 (*S*), *June*, 1942.—[See Abstr. 666 B (1943)].

916 539.43 : 621.824

**Fatigue strength of crankshafts.** *Engineering*, 154, *pp.* 58–59, *July* 17, *and pp.* 78–80, *July* 24, 1942.—Extract of the Report of the Automobile Research Committee of the Instn Auto. Engrs.

917 539.431 : 620.19 : 669.14

**The effect of zinc on the corrosion-fatigue life of steel.** STUART, N., AND EVANS, U. R. *J. Iron Steel Inst.*, [14 *pp.*], 1943. *Advance copy.*—On cold-rolled steel (0·26% C) wetted with rel. strong acid a Zn contact increased the fatigue life of the steel. At 0·001 *N* and 0·00125 *N* contact with Zn had no significant influence, but here the life is rel. long in any case. Steel previously charged with H by cathodic treatment showed a long fatigue life, even though the gas charge far exceeded that which would be produced by contact with Zn. A H charge is not dangerous, if the alternating stressing does not exceed the range needed to produce permanent set. Specimens exposed to the atmosphere in contact with Zn suffered less visible attack than those without Zn protectors, but the fatigue life was not increased. Contact with Zn may have value in some conditions, and the dangers arising from a H charge are not serious.

918 539.431 : 621.822 : 621.43

**An investigation into the cause of the failure of the main bearings of internal-combustion engines.** DOREY, S. F., AND FORSYTH, G. H. *Trans. Instn Nav. Archit., Lond.*, 84, *pp.* 153–189; *Disc.*, 189–196, 1942.

*See Abstr.* 827 539.431 : 621.833 : 534.13

919 539.62

**The physical basis of seizure.** SMITH, E. A. *Engineering*, 154, *pp.* 481–482, *Dec.* 18, 1942.—When 2 metallic surfaces rub over one another, the tem-

perature of the faces tends towards a wave form; the same applies to projections, but the rise in temperature is then more abrupt. At low speeds, the high spots on opposite faces tend to pierce the film of lubricant and to weld together. When a high spot melts, the temperature does not increase still further. Consequently, if a metallic surface with a rel. low m.p. is operated against one which is harder and has a higher m.p., the max. temperature at the interface would probably be that of the lower m.p. This is one of the reasons for using a soft bearing metal with a steel shaft. Seizure is often preceded by a drop in friction, which may be due to the fluid condition of the hot adsorbed film left betw. the faces when the fluid film is broken down by pressure. A. C. W.

## PHYSICAL CHEMISTRY

920 541.115 : 541.552

**Rates of pyrolysis and bond energies of substituted organic iodides. I.** BUTLER, E. T., AND POLANYI, M. *Trans. Faraday Soc.*, 39, *pp.* 19–36, *Jan.*, 1943.—An attempt has been made to determine the C–I bond energy and its variations under the influence of various substituents by measuring the rates of pyrolysis of the compounds in question. Variations in bond energy are very marked. For a number of simple hydrocarbons the previously known activation energy of the reaction RCl + Na appears ∝ the bond energy R–I, the proportionality factor being 0·28. Negative substituents depress the activation energy below the value corresp. to the bond energy.

*See Abstr.* 871 541.12 : 536.71

*See Abstr.* 951 541.123.21 : 541.57

921 541.123.31

**Vapour/liquid equilibrium of methanol–ethanol–water.** GRISWOLD, J., AND DINWIDDIE, J. A. *Industr. Engng Chem.*, 34, *pp.* 1188–1191, *Oct.*, 1942.—Ternary vapour/liquid equilibria at atm. press. are presented. No ternary azeotrope was found. Requirements of a dehydration agent for the manufacture of anhydrous ethanol by distillation are discussed; methanol is not suitable.

922 541.123.4

**The partition function of a simple liquid.** RICE, O. K. *J. Chem. Phys.*, 10, *p.* 654, *Oct.*, 1942.

923 541.124

**Allylic rearrangements. XIII. Kinetics and mechanisms of the conversion of crotyl and methylvinylcarbinyl chlorides to acetates and ethyl ethers.** ROBERTS, J. D., YOUNG, W. G., AND WINSTEIN, S. *J. Amer. Chem. Soc.*, 64, *pp.* 2157–2164, *Sept.*, 1942.—The compositions of the products can be well accounted for on the basis that bimolecular replacement of the chloride group by an ethoxide or acetate ion gives rise only to the normal product while solvolytic or $S_N1$ type reaction gives rise to a mixture of allylic isomers. By choosing conditions unfavourable for the $S_N1$ type of reaction, it is possible to convert the butenyl halides to the corresponding pure acetates or ethyl ethers.

924 541.124

**Resonance and chemical reactivity.** POLANYI, M. *Nature, Lond.*, 151, *pp.* 96–98, *Jan.* 23, 1943.—Wherever alternative bond assignments are possible it appears useful to take them into account and to represent the actual state of the molecule as resonating betw. all the component pure states. This view is extended to the consideration of the initial and final states of a chemical reaction as alternative bond assignments of the same atomic system. Of particular interest are the transition states, and the theory of chemical reactions consists mainly in attempts to predict the energy level of the lowest state, by which the activation energy of the reaction is determined. The reaction of Na and methyl chloride is considered in detail. The argument is extended to include a radical like alkyl and benzyl which resonates in the free state, whereas resonance is absent in the corresp. molecule, and for the converse case exemplified in vinyl chloride and chlorobenzene. A table of exp. data is given. A parallelism exists betw. activation energy and the postulated variation of reaction heat. H. H. HO.

925 541.124

**The activation energy of the reaction $CH_3 + HBr = CH_4 + Br$ and the carbon-hydrogen bond strength in methane.** ANDERSEN, H. C., AND KISTIAKOWSKY, G. B. *J. Chem. Phys.*, 11, *pp.* 6–10, *Jan.*, 1943.—Mixtures of HBr, $CH_3I$ and I were illuminated with ultraviolet light, and the rate of formation of $CH_4$ as a function of the rel. conc. determined. With I absent a max. amount of $CH_4$ is formed, due to the absence of recombining reactions of $CH_3$ radicals and I. A comparison of the amount of $CH_4$ produced with I present in various amounts with that produced when I is absent gives the rel. rates of the reactions $CH_3 + HBr = CH_4 + Br$, $CH_3 + I_2 = CH_3I + I$, when the rel. steric factors of the two reactions are approx. the same as for the reactions $H + HBr = H_2 + Br$, $H + Br_2 = HBr + Br$. This leads to an activation energy of 1·5 kcal. for the $CH_3$-HBr reaction, which, combined with the activation energy of the reverse reaction, yields a binding energy of 102 kcal. for $CH_3$–H.

926 541.124 : 541.64

**The influence of reaction mechanism on size distribution in polymers.** HERINGTON, E. F. G., AND ROBERTSON, A. *Trans. Faraday Soc.*, 38, *pp.* 490–501, *Nov.–Dec.*, 1942.—Distribution curves of the product of the reaction where the polymer grows by successive addition to active radicals can be derived for the general case where the ratio (termination coeff.)/(propagation coeff.) is considered to vary with chain length. The effect of decrease of monomer conc. during the reaction is discussed. It is essential to have approx. instantaneous distribution curves. Methods are developed by which the variation of the above ratio with chain length may be determined.

927 541.124.7 : 541.182.6

**Exchange of radioactive silver and bromide with silver bromide suspensions.** LANGER, A. *J. Chem. Phys.*, 11, *pp.* 11–15, *Jan.*, 1943.—Both constituents of the $AgBr_2$ lattice exchange with the ions in solution. Dependence of exchange rate on the amount of surface of the precipitates used was observed. A difference was found in the exchange rate for bromide if dye molecules were adsorbed on the precipitate prior to the exchange experiment. The rate for Ag was not affected. [See Abstr. 2680 (1942)].

928 541.127

**The temperature dependence of reaction rates from the standpoint of the Brönsted–Christiansen–Scatchard equation.** AMIS, E. S., AND JAFFÉ, G. *J. Chem. Phys.*, 10, *pp.* 646–650, *Oct.*, 1942.—Arguments are presented for splitting the log $k_{\infty}^{\circ}$ term in the general kinetic equation into a part which represents the rate const. extrapolated to a std. ref. state of temperature, dielectric const. and conc., and a part giving the temperature dependence. The repulsive potential between reactants at close distances is formulated and incorporated in the general kinetic equation to give the temperature dependence of the reaction rate const. This equation is applied to existing kinetic data and found satisfactory.

929 541.127

**The kinetics of the autoxidation of inorganic reducing agents. I. Titanous chloride.** MACKENZIE, H. A. E., AND TOMPKINS, F. C. *Trans. Faraday Soc.*, 38, *pp.* 465–473, *Nov.–Dec.*, 1942.—The factors affecting the rate of autoxidation of titanous chloride in aq. solution were studied by an absorption method. The rate is a linear function of the oxygen partial pressure and varies inv. as the conc. of the free HCl in solution.

930 541.127

**Some factors affecting the reduction of silver oxalate.** JAMES, T. H. *J. Chem. Phys.*, 10, *pp.* 744–746, *Dec.*, 1942.—Silver oxalate precipitates age rapidly, and the process is not impeded by adsorption of wool violet or 3,3′-diethyl-9-methylthiacarbocyanine. Gelatin decreases the rate of reaction between silver oxalate and hydroxylamine in slightly acid solution. The dye, 3,3′-diethyl-9-methylthiacarbocyanine, has a much smaller effect than gelatin upon the reaction rate. The effect of bromide ion upon the gaseous products of the reaction betw. silver oxalate and hydroxylamine in alkaline solution is smaller than in the corresp. reactions of AgCl and thiocyanate.

931 541.128

**Acidic and basic catalysis in urethan formation.** TARBELL, D. S., MALLATT, R. C., AND WILSON, J. W. *J. Amer. Chem. Soc.*, 64, *pp.* 2229–2230, *Sept.*, 1942.

932 541.128

**Catalysts for sodium chlorate in weed destruction.** DANCASTER, E. A. *Nature, Lond.*, 150, *pp.* 737–738, *Dec.* 19, 1942.—[See Abstr. 570 (1942)].

933 541.132/.133

**Potential of silver concentration cells with liquids of low dielectric constant.** GEMANT, A. *J. Chem. Phys.*, 10, *pp.* 723–730, *Dec.*, 1942.—Measurements were made on Ag and Ag/AgCl conc. cells containing solutions of dielectric const. 2·6 and sp. conductances $10^{-11}$ mho/cm. The results were supplemented by conductivity measurements on all solutions involved. Approx. values for the dissociation const. and electrochem. transf. numbers of the electrolytes were deduced.

934 541.133

**The conductance of aqueous solutions of potassium bromide at temperatures from 15° to 45°C., and the limiting mobility of bromide ion.** GUNNING, H. E., AND GORDON, A. R. *J. Chem. Phys.*, 11, *pp.* 18–20, *Jan*, 1943.—The conductance at conc. 0·0005 *N*–0·01 *N* for temp. 15°–45°C. has been measured by the d.c. method [Abstr. 1385 (1942)]. The lim. mobility of bromide ion is obtained from the lim. conductance and the known mobility of K ion; the temp. coeff. of the lim. bromide ion mobility are 2% less than the corresp. values for chloride ion.

935 541.133.1

**Automatic adjustment of solute concentration in the "moving-boundary" method for the determination of transport numbers.** WRIGHT, R. *J. Chem. Soc.*, *pp.* 678–680, *Nov.*, 1942.—The change in conc. of the indicator solution with the passage of current has been determined by direct chemical analysis of samples of the solution taken from different parts of the transport apparatus.

936 541.134

**The elimination of liquid-junction potentials. IV. The conditions of extrapolation.** OWEN, B. B., AND BRINKLEY, S. R., JR. *J. Amer. Chem. Soc.*, 64, *pp.* 2071–2075, *Sept.*, 1942.

937 541.134

**Polarographic investigation of rhenium compounds. II. Oxidation of − 1 rhenium at the dropping electrode and the potential of the $Re^{+2}$–$Re^{-1}$ couple.** LINGANE, J. J. *J. Amer. Chem. Soc.*, 64, *pp.* 2182–2190, *Sept.*, 1942.—A Zn reductor is described in which reduction can be performed at a controlled temperature and in the absence of O. Polarograms of solutions of − 1 Re in 1 to 2 *N* $H_2SO_4$ at 0° display 3 anodic waves. A somewhat similar polarogram is obtained in 1 *N* perchloric acid. Diffusion-current data show that corresp. waves in the two media pertain to the same oxidation states and in both media the diffusion currents are ∝ the conc. of − 1 Re.

938 541.135.5 : 591.121.2

**Micro-electrodes for measuring local oxygen tension in animal tissues.** DAVIES, P. W., AND BRINK, F., JR. *Rev. Sci. Instrum.*, 13, *pp.* 524–533, *Dec.*, 1942.—A description of 2 types of stationary Pt micro-electrodes which electrolyse dissolved O when suitable potentials are applied. It is possible to measure the O tension in an open solution and to estimate local O tension in animal tissues as a function of position with a spatial resolution of 25 $\mu$. One type, with the end of the Pt wire recessed inside the cylindrical glass tip, can be used to measure abs. O tensions once every 5 min. The other, an open type, allows the estimation of rel. tensions only, but gives continuous readings.

939 541.135.6

**Studies in hydrogen over-voltage at high current densities. VI. The mechanism of hydrogen over-voltage.** HICKLING, A., AND SALT, F. W. *Trans. Faraday Soc.*, 38, *pp.* 474–490, *Nov.–Dec.*, 1942.—[See Abstr. 2166 (1941)]. Current theories are considered in rel. to exp. results, particularly those in the high-current-density range. Neutralization of the H ion is not the rate-determining step responsible for over-voltage, but this is due to accumulation of atomic H at the electrode. A new theory of overvoltage is developed which agrees with exp. results.

940 541.136

**A modified calomel cell for *p*H measurements.** LAUCHLAN, A. D. E., AND PAGE, J. E. *Nature, Lond.*, 151, *p.* 84, *Jan.* 16, 1943.

941 541.141

**Counting of free alkyl radicals. Application to the photolysis of acetone.** FELDMAN, M. H., RICCI, J. E., AND BURTON, M. *J. Chem. Phys.*, 10, *pp.* 618–623, *Oct.*, 1942.—Long, heavy lead mirrors are deposited in a reaction tube, and metal is transported therefrom by free radicals according to the Paneth method. The lead alkyl is collected and the lead determined by a micro-method. The method is appl. to the photolysis of acetone at 2 537 Å.

942 541.141

**The cadmium ($^3P_1$) photosensitized reactions of the lower olefins.** LEROY, D. J., AND STEACIE, E. W. R. *J. Chem. Phys.*, 10, *pp.* 683–685, *Nov.*, 1942.—An investigation made for ethylene, propylene, butene-1 and butene-2. The low quantum yields are attributed to the influence of the C=C bond on the actual quenching process and are not inconsistent with the data on C—H bond strengths.

943 541.141.1

**Mechanism of the photolysis of propionaldehyde.** GARRISON, W. M., AND BURTON, M. *J. Chem. Phys.*, 10, *pp.* 730–739, *Dec.*, 1942.—The photolysis of propionaldehyde at λλ2 537, ~2 900 and ~3 200 Å was studied by the Paneth mirror method. The alkyl radicals produced are exclusively ethyl; no atomic H can be detected in amounts exceeding 2% of the total number of mirror-active particles present. The yield of $C_2H_5$ radicals was determined and compared with yields of CO, $H_2$ and $C_2H_6$. The results are interpreted in terms of competing primary decomposition processes producing free radicals in one reaction and ultimate molecules in another. An explanation can be given on the basis of a mechanism involving only the production of free radicals in the primary process at all wavelengths. The mechanism of energy transfer within the propionaldehyde molecule is discussed.

944 541.141.11

**The mercury photosensitized reactions of ethylene at high temperatures.** LEROY, D. J., AND STEACIE, E. W. R. *J. Chem. Phys.*, 10, *pp.* 676–682, *Nov.*, 1942.—The mercury ($^3P_1$) photosensitized reactions of ethylene were investigated at 25°–350°C. There was a considerable increase in the quantum yield at high temperatures and this is attributed to the H atom and vinyl radical sensitized polymerization of ethylene. The reactions of ethylene with Na($^2P$). Cd($^3P_1$), Zn($^3P_1$), Hg($^3P_1$), Cd($^1P_1$) and Zn($^1P_1$) atoms are summarized.

945 541.18.043

**Ultracentrifuge cell.** PICKELS, E. G. *Rev. Sci. Instrum.*, 13, *pp.* 426–434, *Oct.*, 1942.—Difficulties of leakage, distortion, breakage of quartz windows and lack of facilities for proper alignment, have been overcome through the strengthening of cell parts, the use of a specially coated duralumin centrepiece, the provision of a key for alignment and an arrangement for always orienting the windows in the same manner to prevent reversal of stresses.

*See Abstr.* 927 541.182.6 : 541.124.7

946 541.452

**Relative acid strengths of formic, acetic, and propionic acids in alcohols and dioxane-water mixtures.** KILPATRICK, M., AND EANES, R. D. *J. Amer. Chem. Soc.*, 64, *pp.* 2065–2067, *Sept.*, 1942.—I dioxane-water mixtures, the log of the acid strengt of formic or of propionic acid rel. to acetic is not linear function of the reciprocal of the dielectri const. of the medium. In the pure solvents studied– water, ethylene glycol, methyl alcohol and ethy alcohol—a linear relationship holds. This sam phenomenon has been observed in the case of th substituted benzoic acids.

947 541.454

**Steric strains and the anomalous base strengths of th methylamines.** BROWN, H. C., AND BARTHOLOMAY H., JR. *J. Chem. Phys.*, 11, *p.* 43, *Jan.*, 1943.

948 541.5

**Difficulties in the valence bond theory.** FAJANS, K *J. Chem. Phys.*, 10, *pp.* 760–761, *Dec.*, 1942.

*See Abstr.* 920 541.552 : 541.115

949 541.56

**Nature of the covalent binding.** BERLIN, T., AN FAJANS, K. *J. Chem. Phys.*, 10, *pp.* 691–692, *Nov.* 1942.

950 541.57

**The carbon-carbon bond strengths in ethane, propan and *n*-butane.** ARTSDALEN, E. R. VAN. *J. Chem Phys.*, 10, *p.* 653, *Oct.*, 1942.

*See Abstr.* 831 541.57 : 534.22

951 541.57 : 541.123.21

**The hydrogen bond and the hydration of organi molecules.** STAVELEY, L. A. K., JEFFES, J. H. E., AN MOY, J. A. E. *Trans. Faraday Soc.*, 39, *pp.* 5–13 *Jan.*, 1943.—Information about the hydration o molecules of organic substances can be obtained b studying the effect of these substances at low conc on the solubility of water in a non-polar solvent Six compounds were examined in benzene solutio in this way. The results, together with those give in the literature for other substances, are discusse with rel. to the nature of the bond and the condition governing its formation. Water is several time more soluble in benzene than in any other non-pola liquid. It is concluded that the molecules of wate and benzene have a slight tendency to associate wit one another.

*See Abstr.* 966 541.6 : 548.73

952 541.64

**Random reorganization of mol.-weight distributio in linear condensation polymers.** FLORY, P. J. *J. Amer. Chem. Soc.*, 64, *pp.* 2205–2212, *Sept.*, 1942.

*See Abstr.* 926 541.64 : 541.124

953 541.64 : 679.56

**The preparation and polymerization of methyl vinyl ketone.** WHITE, T., AND HAWARD, R. N. *J. Chem. Soc.*, *pp.* 25–33, *Jan.*, 1943.—Methyl vinyl ketone is of importance in view of its capacity for polymerization to a thermoplastic resin. A detailed study has been made of the acetone-formaldehyde condensation with a view to establish the optimum conditions for the production of 3-ketobutanol, from which methyl vinyl ketone is obtained by dehydration. The condensation is complex and its various products are discussed and characterized.

954 541.64 = 3

**On the mechanism of the thermal polymerization of ...rol.** BREITENBACH, J. W. *Naturwissenschaften*, ... *p.* 708, *Nov.* 21, 1941. H. G. S.

955 541.66

**The systems phenol-glucose-β-pentacetate, phenol-...llobiose-α-octacetate, and *p*-nitrophenol-cellobiose-α-...tacetate.** MARSDEN, R. J. B., BAINBRIDGE, J. M., ...ND MORRIS, A. *Trans. Faraday Soc.*, 39, *pp.* 1–5, ...*m.*, 1943.—A previous suggestion [Abstr. 2828 ...942)] is investigated. An examination is made by ...o. determinations of the phase relationships betw. ...henol and *p*-nitrophenol on the one hand, and ...ucose-β-pentacetate and cellobiose-α-octacetate on ...e other. The system phenol-glucose-β-pentacetate ...solved itself into a simple 2-comp. system with a ...ngle eutectic, and with no hint of compound forma-...n. Results for the systems containing cellobiose-α-...tacetate exhibit complex formation which could be ...xplained by a H-bond structure. H. H. HO.

956 541.68

**The reactivity of the cystine linkage in keratin ...res. III. The action of oxidizing agents.** STOVES, ... L. *Trans. Faraday Soc.*, 38, *pp.* 501–506, *Nov.*–...*ec.*, 1942. [See Abstr. 2728 (1942)].—The first ...action in keratin fibres treated with oxidizing ...gents is hydrolysis of the cystine linkage. Subse-...uent oxidation gives rise to sulphinic or sulphonic ...ids, according to the degree of oxidation taking ...ace. The severity of cystine linkage attack is ...etermined by *p*H, temperature, conc. of oxidizing ...gents, and the presence of Cu/Ni/Co/Fe salts within ...he fibre. The tensile strength of fibres damaged by ...eatment with oxidizing agents can be partially ...stored by after-treatment with benzoquinone, or ...CHO (*p*H8). $Hg(OAc)_2$ in *N*/10 HOAc increases ...bre strength beyond that of normal hair. The ...ature of linkage rebuilding processes is discussed.

957 542.23

**Flask design and high-speed stirring.** MORTON, ... A., DARLING, B., AND DAVIDSON, J. *Industr. ...ngng Chem.* (*Analyt. Edit.*), 14, *pp.* 734–736, *Sept.* 15, ...942.

958 542.65

**Apparatus for crystallization and filtration at low ...mperatures.** QUACKENBUSH, F. W., AND STEEN-...OCK, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, ...*p.* 736–737, *Sept.* 15, 1942.

959 542.65

**Enclosed laboratory apparatus for effecting repeated ...rystallizations from solvents.** PIPER, J. D., KERSTEIN, ... A., AND FLEIGER, A. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 738–739, *Sept.* 15, 1942.

*See Abstr.* 837 544.6 : 535.243-1

*See Abstr.* 844, 845 544.6 : 535.331.03

## CRYSTALLOGRAPHY

*See Abstr.* 879 548 : 535.3 : 536.49 : 537.531 = 4

*See Abstr.* 869 548 : 536.631

*See Abstr.* 878 548 : 537.529 = 82

*See Abstr.* 904 548 : 539.26

*See Abstr.* 873 548 : 539.32 : 537.228.1

960 548.1

**The crystal structure of β-glycylglycine.** HUGHES, E. W., AND MOORE, W. J. *J. Amer. Chem. Soc.* 64, *pp.* 2236–2237, *Sept.*, 1942.

961 548.55

**Rate of crystal growth in drawn tungsten wires as a function of temperature.** ROBINSON, C. S., JR. *J. Appl. Phys.*, 13, *pp.* 647–651, *Oct.*, 1942.—Large single crystals can be grown in "218" and similar tungsten wires by vacuum heating at a const. temperature (1 900° to 2 200°K.). The growth can be followed by observation of the thermionic emission pattern, using a cylindrical electron-projection tube with a fluorescent screen. The rate of growth increases with temperature according to an exponential law. Crystal growth is slower in wires drawn to smaller dia.

962 548.73

**Precipitation in single crystals of silver-rich and copper-rich alloys of the silver-copper system.** JONES, F. W., LEECH, P., AND SYKES, C. *Proc. Roy. Soc. A*, 181, *pp.* 154–168, *Dec.* 31, 1942.—The course of precipitation at different temperatures in Ag-rich and Cu-rich single crystals of Ag-Cu alloys of various compositions was studied by X-ray methods. Precipitation is continuous at the higher temperatures when the deg. of supersaturation is low and discontinuous when the temperature is low and the supersaturation is high. The exp. results are considered in rel. to theories.

963 548.73

**Tabulated diffraction data for cubic isomorphs.** FREVEL, L. K. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 687–693, *Sept.* 15, 1942.

964 548.73

**An X-ray investigation of the structure of lead chromate.** BRODY, S. B. *J. Chem. Phys.*, 10, *pp.* 650–652, *Oct.*, 1942.—Positions of the Pb and Cr atoms were determined.

965 548.73

**Orientation of diamonds by X-rays.** WOOSTER, N. *Gemmologist*, 12, *pp.* 1–3, *Jan.*, 1943.—Describes a quick method of determining the orientation of diamond by the use of an ionization spectrometer with a special crystal holder. The position of the crystal is adjusted until reflections are obtained in turn from 2 pre-selected planes, and the orientation of the crystal with resp. to 2 flat fiducial planes is thereby obtained. J. T.

966 548.73 : 541.6

**The crystal structure of rubber hydrochloride.** BUNN, C. W., AND GARNER, E. V. *J. Chem. Soc.*, *pp.* 654–658, *Nov.*, 1942.—The structure was determined by X-ray methods. The unit cell is monoclinic (pseudo-orthorhombic) with $a = 5183$, $b = 10{\cdot}38$, $c = 8{\cdot}95$ Å; $\beta = 90°$. Two long-chain molecules pass through this unit cell. The symmetry of the arrangement is $P2_1/c$. The relation betw. mol. structure and the physical properties (particularly the m.p.) is discussed.

967 548.73 : 669.14

**The mechanism of phase change in some iron-silicon alloys.** LIPSON, H., AND WEILL, A. R. *Trans. Faraday Soc.*, 39, *pp.* 13–18, *Jan.*, 1943.—The equili-

brium diagram of the system Fe-Si is considered in the light of crystallographic evidence, and it is concluded that the phase $\eta$ dissociates into $\alpha + \varepsilon$ by both a peritectoid reaction at 1 030°C. and a eutectoid reaction at 825°C. The changes of the proportions of phases present in an alloy quenched from above the higher temperature when it is annealed below the lower one have been investigated by X-ray methods; the original $\alpha$ phase disappears and is then replaced by the final one, which has a different silicon content. A possible reason for this, based on free-energy differences, is given.

## GEOPHYSICS

968 550.341

**On pulses whose travel times are not true minima.** JEFFREYS, H. *Proc. Camb. Phil. Soc.*, 39, *pp.* 48–51, *Jan.*, 1943.

969 550.346 : 621.311(931)

**Earthquake in New Zealand affects supply.** *Distrib. Elect.*, 15, *p.* 77, *Jan.*, 1943.

970 550.372 : 621.317.331 = 3

**The measurement of earth conductivity.** GROSSKOPF, J., AND VOGT, K. *TFT [Telegr.- Fernspr.- Funk- und Fernsehtechn.]*, 31, *pp.* 22–23, *Jan.*, 1942.—A simplification of the dipole method of measurement.

E. R. A.

*See Abstr.* 895 550.4 : 539.163

971 550.42 : 539.16

**The distribution of helium and radioactivity in rocks. IV. Helium age investigations of diabase and granodiorites from Yellowknife, Northwest Territories, Canada.** KEEVIL, N. B., JOLLIFFE, A. W., AND LARSEN, E. S. *Amer. J. Sci.*, 240, *pp.* 831–846, *Dec.*, 1942.—[See Abstr. 1692 (1942)]. He indices of a diabase and its constituent minerals were generally higher than those for the granodiorites that are cut by the diabase. The data for granitic rocks are comparable with those for Algoman intrusives elsewhere, so that the diabase and later faulting and mineralization are probably post-Algoman.

972 550.831

**Let's take a look at the gravity meter.** FENWICK, W. H. *Min. Mag.*, 32, *pp.* 504–507 *and* 509, *Oct.*, 1942.—A discussion of the methods employed in making a gravity-meter survey for oil exploration purposes as practised in the last few years.

973 550.834.5

**Computing seismic reflection data by simple consistent method.** SOSKE, J. L. *Min. Mag.*, 32, *pp.* 489–495 *and* 564, *Oct.*, 1942.—The fundamentals and basic assumptions of reflection dip data are reviewed. Simplified and rigorous equations of calculation consistent with the velocity/depth functions and laws of wave propagation are given. The theory of computing charts for this method is outlined and several chart types are developed. The errors and limitations of certain computation methods are discussed.

974 551.506.8

**Report on the phenological observations in th British Isles from Dec., 1941, to Nov., 1942.** GUNTON H. C. *Quart. J. Roy. Met. Soc.* (*Phenol. Rep.*), 69 *No.* 299, *pp.* 1–32, 1943.

975 551.583.3 : 525.3 =

**The components of the earth's orbit and the climat in the ice age.** WUNDT, W. *Naturwissenschafte* 30, *pp.* 93–97, *Feb.* 13, 1942.—The occurrence of th ice ages is explained on the basis of the variations c the 3 components of the earth's orbit—inclination c the axis, eccentricity, and position of the perihelion— and the effect of reflection. Objections are reviewe in the form of a series of questions and answers.

H. G. S

976 551.594.11 = 3

**Abrupt changes in the electric field of the atmospher and atmospheric discharges.** ISRAËL, H. *Natu wissenschaften*, 30, *pp.* 85–87, *Jan.* 30, 1942. H. G. S

977 551.594.5 = 3

**A new radiation in the aurora borealis of Septem ber 18/19, 1941.** GÖTZ, F. W. P. *Naturwissen schaften*, 29, *p.* 690, *Nov.* 7, 1941. H. G. S

## VARIOUS SUBJECTS

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|---|---|
| *See Abstr.* 815 | 576.3 : 532.612 |
| *See Abstr.* 816 | 576.34 : 532.612 |
| *See Abstr.* 817 | 576.355 : 532.612 |
| *See Abstr.* 819 | 578.08 : 532.712 |
| *See Abstr.* 854 | 581.142 : 535.371 |
| *See Abstr.* 938 | 591.121.2 : 541.135.5 |
| *See Abstr.* 857 | 595.7 : 535.392 |
| *See Abstr.* 818 | 631.432 : 532.68 |
| *See Abstr.* 911 | 669.14 : 539.389.1 |
| *See Abstr.* 967 | 669.14 : 548.73 |
| *See Abstr.* 917 | 669.14 : 620.19 : 539.431 |
| *See Abstr.* 843 | 669.18 : 535.331 |

978 669.3

**Beryllium-copper and its applications.** CROSSLEY D. W., AND FOSTER, E. M. *J. Sci. Instrum.*, 20 *pp.* 7–9, *Jan.*, 1943.

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| *See Abstr.* 912 | 669.7 : 539.389.4 |
| *See Abstr.* 915 | 677 : 620.16 : 539.42 |
| *See Abstr.* 910 | 677.31 : 539.388.8 |
| *See Abstr.* 870 | 678 : 539.31 : 536.71 |
| *See Abstr.* 899 | 679.5 : 539.214.07 |
| *See Abstr.* 903 | 679.5 : 620.193.19 : 539.217.3 |
| *See Abstr.* 953 | 679.56 : 541.64 |
| *See Abstr.* 858 | 75 : 535.6 |
| *See Abstr.* 838 | 77.022 : 535.245 |
| *See Abstr.* 900 | 771.5 : 539.215.4 |

979 778.3

**Reflex plate.** *J. Sci. Instrum.*, 20, *p.* 18, *Jan.*, 1943

*See Abstr.* 897 778.31 : 539.181.08